White Paper XIII — Active Galaxies and Conjugation

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Abstract

Every active galaxy functions as a *reciprocal induction machine*. The coupling of its rotating plasma core and magnetic field produces two conjugate polar regimes: (1) *Introfluxive Mode (Compression)* — centripetal, helically wound field, magnetic dominance, radiation suppression; and (2) *Extrofluxive Mode (Emission)* — centrifugal, helically relaxed field, electric dominance, radiation release. The alternation between them maintains global energy conservation while allowing local asymmetry—precisely the behavior measured in VLBI jet polarimetry and Faraday-rotation gradients.

1 · Core Recognition

Every active galaxy functions as a *reciprocal induction machine*. The coupling of its rotating plasma core and magnetic field produces two conjugate polar regimes:

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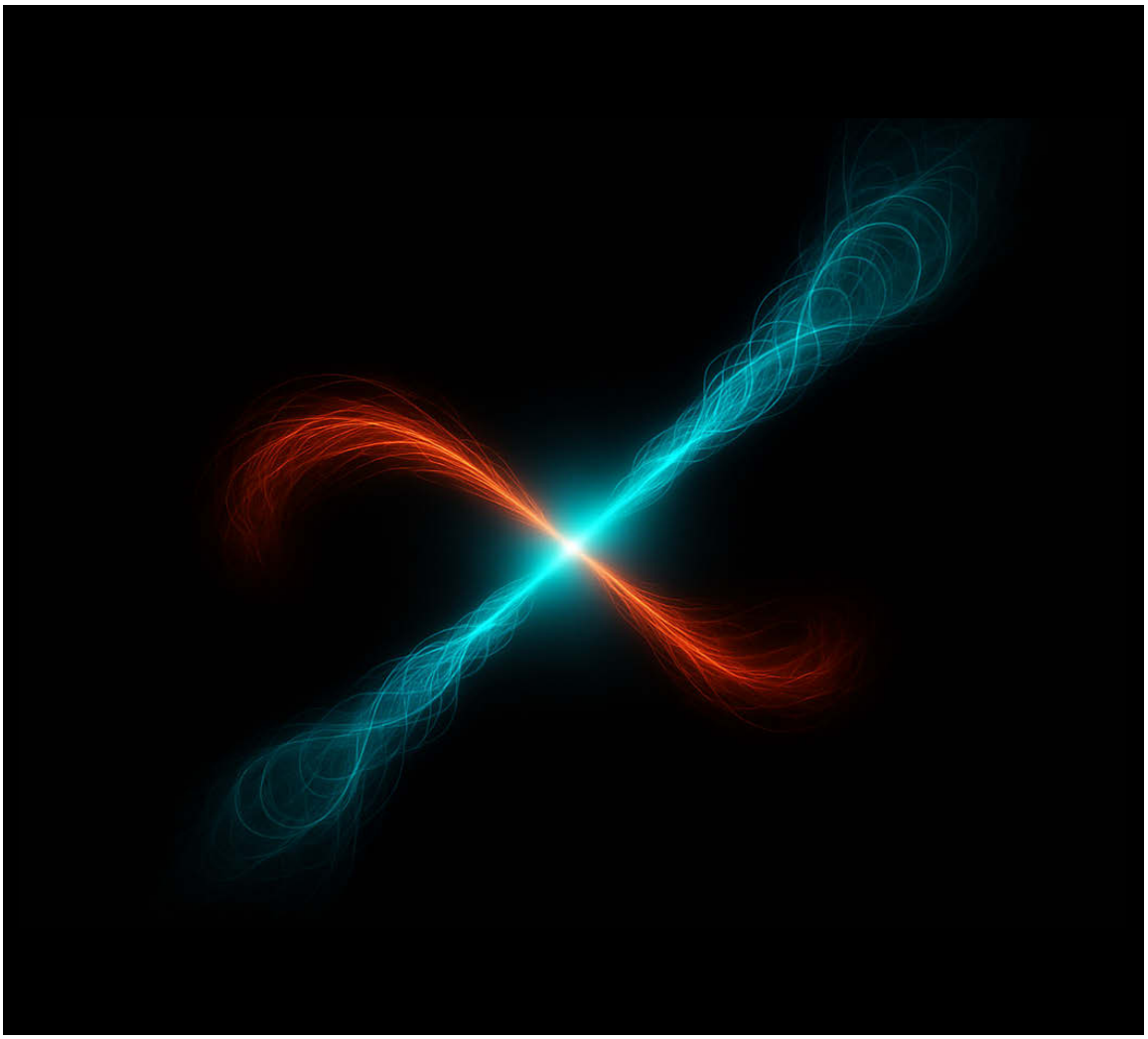

Plate I — M87 Jet Dual Helicity

Schematic placeholder for dual-helicity jet image; caption space reserved.

2 · Conjugation Operator

Let the electric–magnetic bivector pair be (E, B). Reciprocal induction defines a quarter-phase rotation in field space:

$$C : (E, B) \to (B, -E). \tag{1}$$

Successive applications yield

$$C^2(E, B) = (-E, -B), \tag{2}$$

i.e., a 180° phase reversal. Hence the system's polarity oscillates within a closed algebraic cycle, the electromagnetic analogue of yin ↔ yang symmetry.

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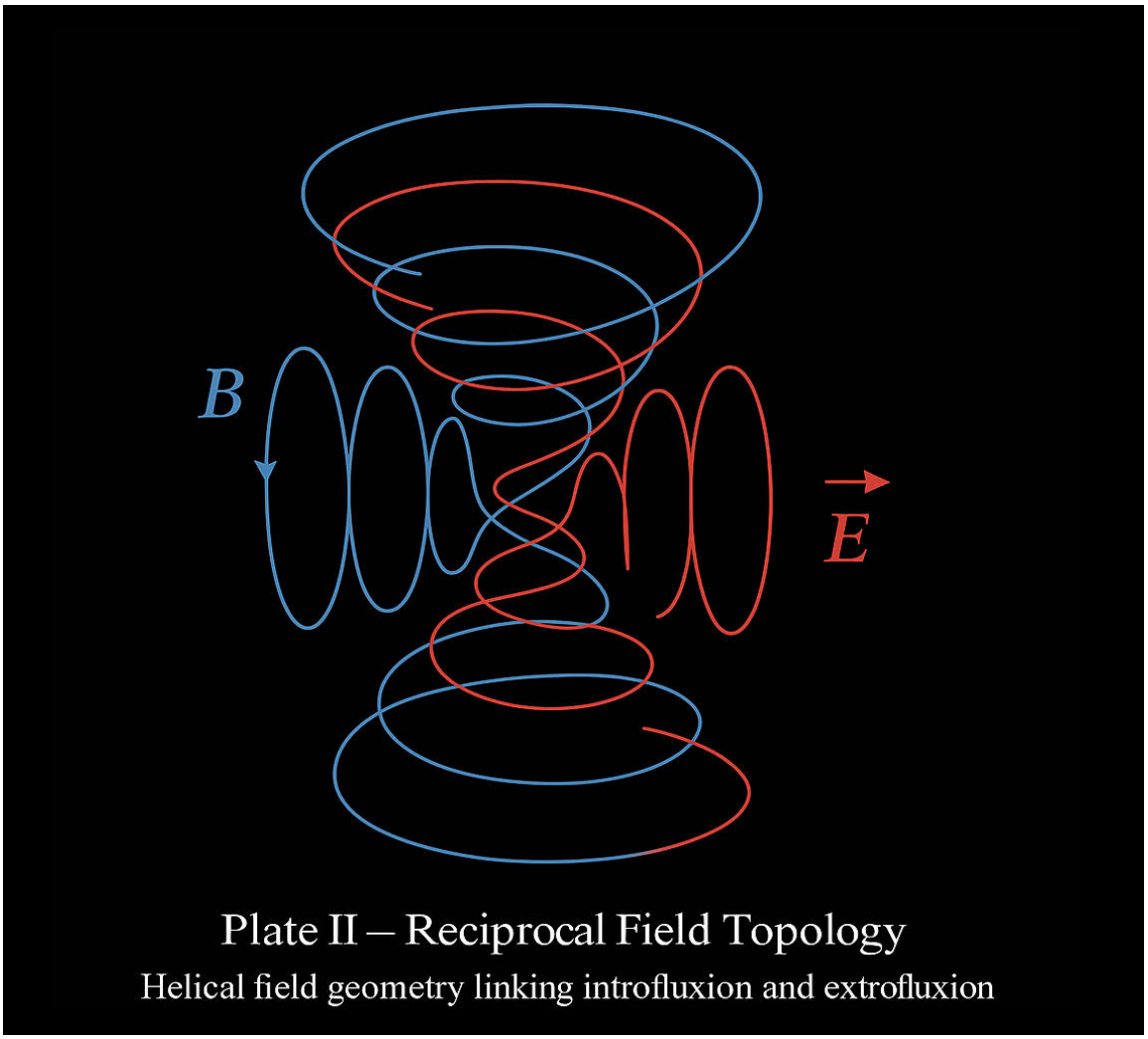
3 · Observational Correlates

Evidence of conjugation in active galaxies includes:

- **Bimodal EVPA alignment**: parallel vs. perpendicular to jet axis.
- **Opposite circular-polarization sign** in counter-jets.
- **Reversing RM gradients** over multi-epoch observations.
- **Spectral hardness asymmetry** between approaching and receding lobes.

Each signature traces a partial or full execution of the conjugation operator within the plasma rotor.



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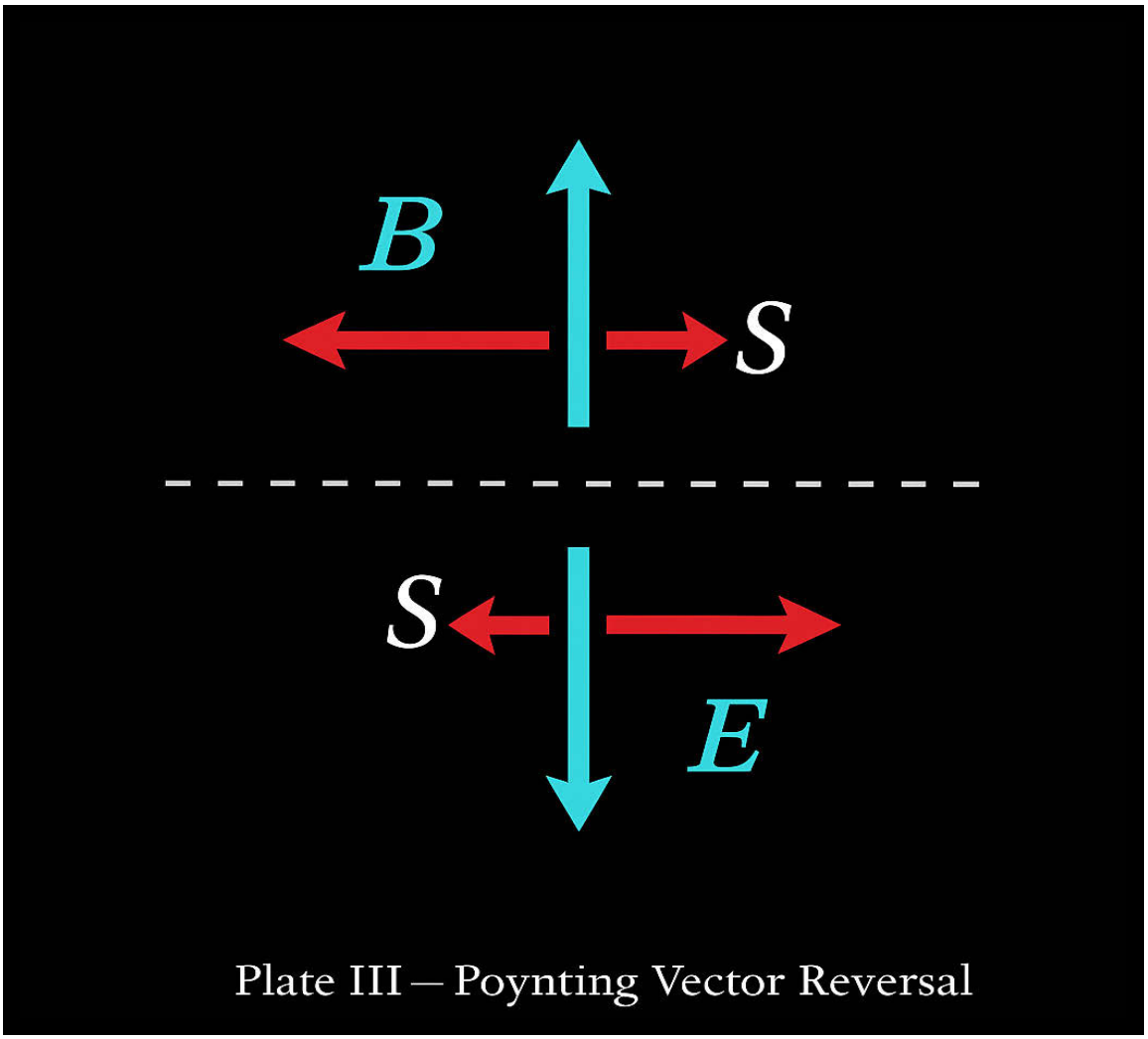
4 · Energetic Mechanism

Reciprocal induction demands that when the magnetic component stores rotational energy (introfluxive phase), the electric component releases radiation (extrofluxive phase). Conjugation ensures no net loss, only alternating expression. The Poynting vector is

$$\mathbf{S} = \frac{\mathbf{E} \times \mathbf{B}}{\mu_0}, \tag{3}$$

and reverses sign with each half-cycle, yielding the observed jet–counter-jet symmetry.



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5 · Cosmological Implication

Across the cosmic population, these conjugate phases populate a continuous *diversity spectrum*. The Universe thus distributes angular momentum and radiative output not randomly but through statistically balanced pairs of conjugated rotors—each galaxy completing its counterpart's phase.

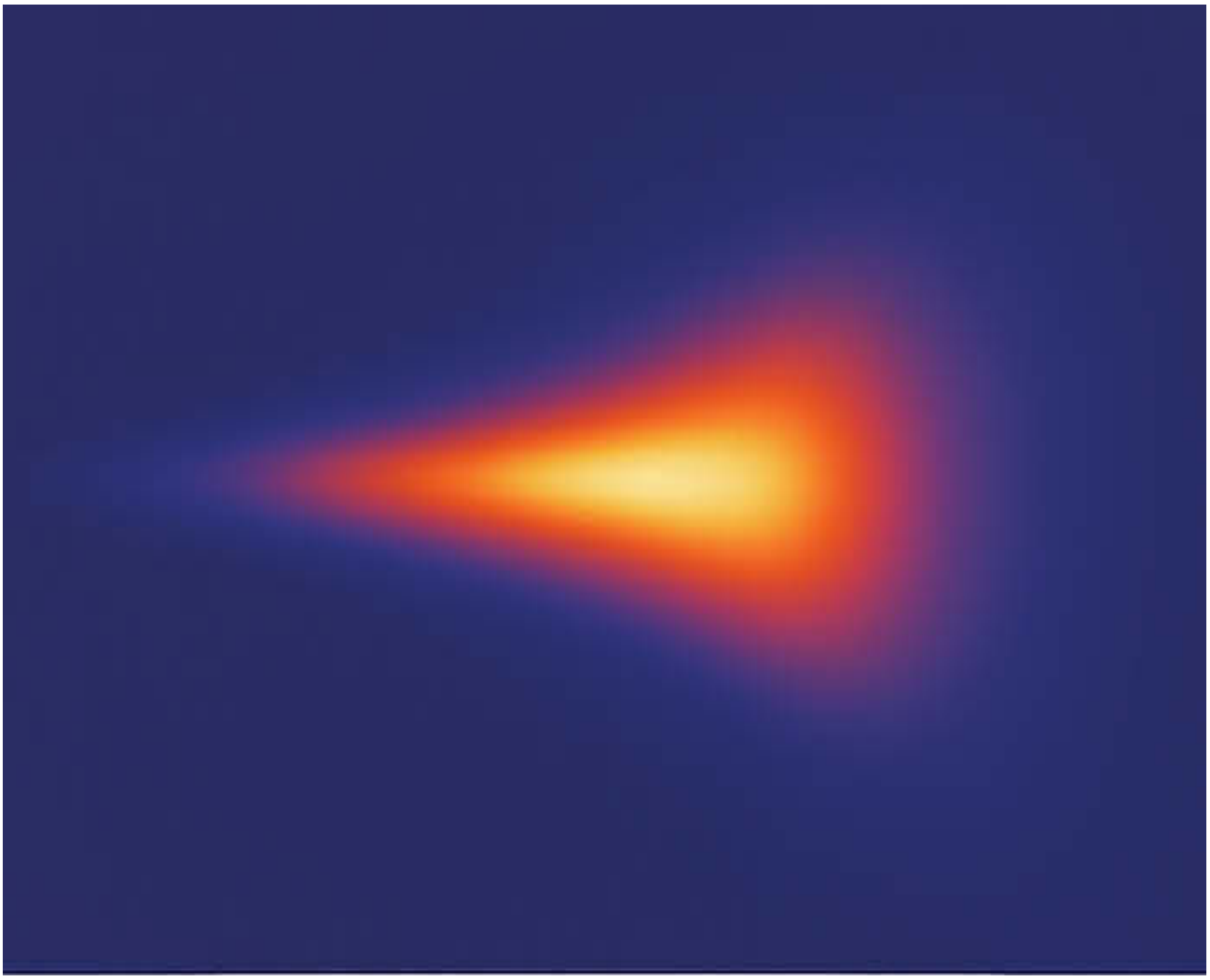

Plate IV — Conjugated Rotor Manifold

6 · Conclusion

Active galaxies are *self-conjugate engines*: their asymmetries are not accidents but the visible halves of a deeper reciprocity. Through conjugation, the cosmos sustains continuity of rotation, radiation, and memory. The operator C embodies the law of mutual reversal—the geometric root of Potentum induction at galactic scale.

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